

DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Cruise Report for the Gulf of the Farallones Cruise
F1-89-NC, F2-89-NC off the San Francisco Bay Area, California,
January 6 through 28, 1989

By

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INTRODUCTION

M/V FARNELLA left Redwood City at 1355 LT (Local Time) on January 6, 1989 (006/1600 GMT) to conduct a reconnaissance investigation of the Gulf of the Farallones from Point Reyes to Half Moon Bay and west to the area where GLORIA side-scan coverage begins. We deployed gear at 1240 LT (2040 GMT) on Leg 1 (F1-89-NC) on January 6 and ended Leg 1 at 1410 LT (2210 GMT) on January 10, 1989. The ship docked at the Port of San Francisco at 1800 LT on January 10 and offloaded personnel from Leg 1 (Table 1). Repairs on shipboard instruments were handled at the dock and Leg 2 personnel were taken aboard. We left the Port of San Francisco to start Leg 2 (F2-89-NC) at 2000 LT on January 12, 1989 (013/0400 GMT). We deployed gear at 0425 LT (1225 GMT) on January 13, 1989, and ended Leg 2 at 1700 LT on January 27, 1989 (027/0300 GMT). M/V FARNELLA docked in Redwood City at 0900 on January 28, 1989, ending Leg 2 (F2-89-NC). Personnel on Leg 2 are listed in Table 2.

The objectives of this reconnaissance investigation were to obtain a baseline data set of high resolution side-scan sonar imagery, single-channel geophysical profiles (high resolution) of the shallow subbottom, intermediate-penetration 40-cubic-inch airgun profiles, and surface sediment samples. The baseline data set was designed to yield scientific results which would allow us to begin to characterize and understand this shallow segment of the continental margin off San Francisco, and to serve as a preliminary database for subsequent, more detailed and site specific studies. Tracklines were oriented both parallel and perpendicular to regional bathymetry.

We collected approximately 2,500 line km of side-scan imagery, high-resolution single-channel seismic and gravity. Additionally, 50 line km of intermediate penetration dual channel airgun profiles and 1,300 line km of 3.5 kHz bathymetry were collected. During the sampling phase of Leg 2 we collected 267 surface sediment grab samples using a Soutar-Van Veen sampler. Tracklines are shown in Figures 1 and 2 and samples are shown in Figure 3.

The two legs of the cruise were successful both in the quantity and quality of data obtained. We were able to survey the entire Gulf of the Farallones from Point Reyes to Half Moon Bay. We were, however, constrained by time and operational difficulties to shelf water depths between about 50 m and 200 m such that the inner shelf and slope/deep-sea floor were not surveyed or sampled on this reconnaissance cruise.

EQUIPMENT REPORT

We experienced difficulties with both deployed instrumentation and ship's equipment. However, we managed to continue operating such that we suffered no down-time when at sea. The primary geophysical system employed was the Hunttec* Hydrosonde Deeptow system. On Leg 1 the Hunttec fish leaked several times such that we were forced to use backup systems (Klein* side scan, EG&G* side scan, ORE* Geopulse boomer). The 40-cubic-inch airgun never produced acceptable results largely due to noise problems. The gravity meter worked well the entire cruise. Navigation employed GPS satellites (about 12 hours a day), Rho-Rho loran, and Del Norte precision navigation using shore-based transponders. Navigation on both legs of the cruise was inconsistent but acceptable overall. Our greatest difficulty was with the Del Norte* system. Transponder

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reception was spotty, producing erroneous navigation results. In addition, the shipboard ABC computer system malfunctioned several times such that we could not produce navigation postplots to evaluate our trackline coverage. M/V FARNELLA also experienced several problems related to the ship's generators. Initially we had problems getting full power to operate the Hunttec due to the ship's generator--such that subbottom penetration and quality was greatly affected until the problem was solved. We also experienced several power surges related to the ship's power which caused extreme problems with our geophysical and navigation systems.

PRELIMINARY SCIENTIFIC RESULTS

The Gulf of the Farallones is an area on which only a relatively small amount of scientific research has been published--especially as of late. The deep framework, tectonics, and regional sedimentology have been reported on. Much work remains to be done though to better understand this shelf area and its deposits and the processes that formed and modify them.

Our reconnaissance investigation revealed that seafloor morphology is variable across the Gulf both in a north-south as well as an east-west sense. High resolution side-scan sonar imagery shows that a variety of bedforms occur on the seafloor. The most common appear to be ripples which occur predominantly in shallow depressions in the seafloor surface. Some areas of the shelf appear to be flat and/or featureless (as determined by the resolution capabilities of our side-scan sonar systems).

High-resolution and intermediate-penetration geophysical profiles indicate well-bedded strata with relatively low apparent dips. Several buried unconformities were also observed within the shallow subbottom. No major faults were observed although folded strata were evident.

Surface sediment grab samples reveal the Gulf shelf to be covered largely by a fine to very fine sand (as determined by visual observation during sampling operations). Shelf areas with mud were observed to the northwest off Point Reyes and to the southwest off Half Moon Bay. Patches of medium to coarse sand were located near the Farallon Islands and Cordell Bank.

ACKNOWLEDGMENTS

We sincerely appreciate the cooperation and support of the officers and crew of the M/V FARNELLA. We also thank Steve Wallace, Tom O'Brien, and the staffs of PMG and AMG marine support groups for their tireless effort and cooperation. Monty Hampton and Steve Eittreim also contributed greatly to the cruise with their logistical and administrative support.

TABLE 1
F1-89-NC Personnel

D. Twichell (USGS, AMG)---Chief Scientist
D. Rubin (USGS, PMG)---Chief Scientist
J. Chin (USGS, PMG)---Chief Scientist
L. Webber (USGS, PMG)---DAFE Curator
D. Nicholls (USGS, AMG)---Electronics Tech.
L. Kooker (USGS, PMG)---Electronics Tech.
T. O'Brien (USGS, AMG)---Electronics Tech.
J. Erickson (USGS, PMG)---Mechanical Tech.
D. Mann (USGS, PMG)---Watchstander
J. Amarena (Volunteer)---Watchstander
M. Sheridan (Volunteer)---Watchstander
L. Pickthorn (USGS, PMG)---Navigator

TABLE 2
F2-89-NC Personnel

B. Schwab (USGS, AMG)---Chief Scientist
J. Chin (USGS, PMG)---Chief Scientist
H. Karl (USGS, PMG)---Chief Scientist
R. Sliter (USGS, PMG)---DAFE Curator
D. Nicholls (USGS, AMG)---Electronics Tech.
T. O'Brien (USGS, AMG)---Electronics Tech.
M. Boyle (USGS, PMG)---Electronics Tech.
J. Thomas (USGS, PMG)---Electronics Tech.
H. Williams (USGS, PMG)---Mechanical Tech.
B. Danforth (USGS, AMG)---Watchstander
G. Gabel (USGS, PMG)---Watchstander
R. Frisch (USGS, PMG)---Watchstander
K. Kinoshita (USGS-PMG)---Navigator
B. Seekins (USGS, PMG)---Navigator

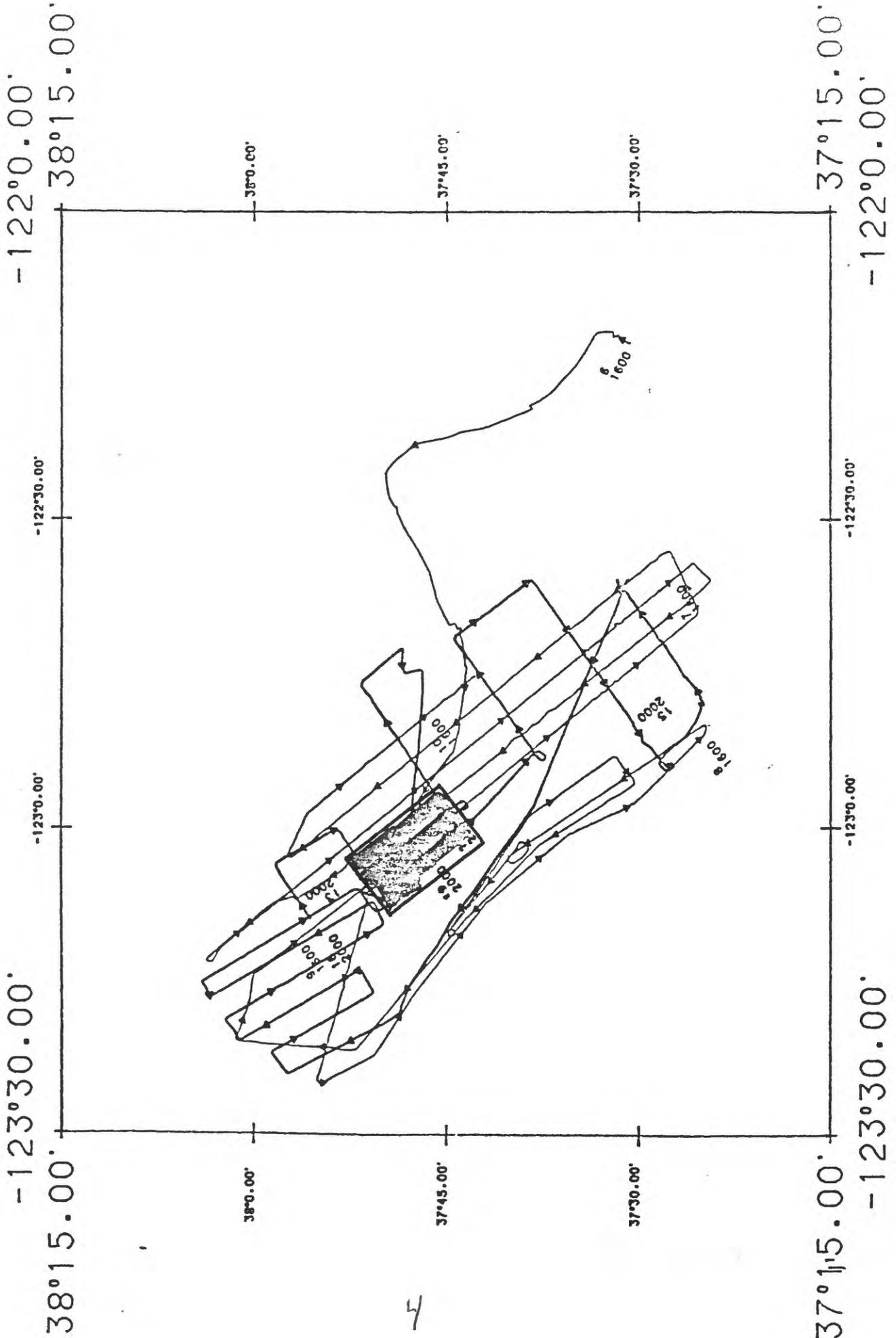


Figure 1. Trackline map for F1-89-NC and F2-89-NC. See Figure 2 for tracklines in boxed area.

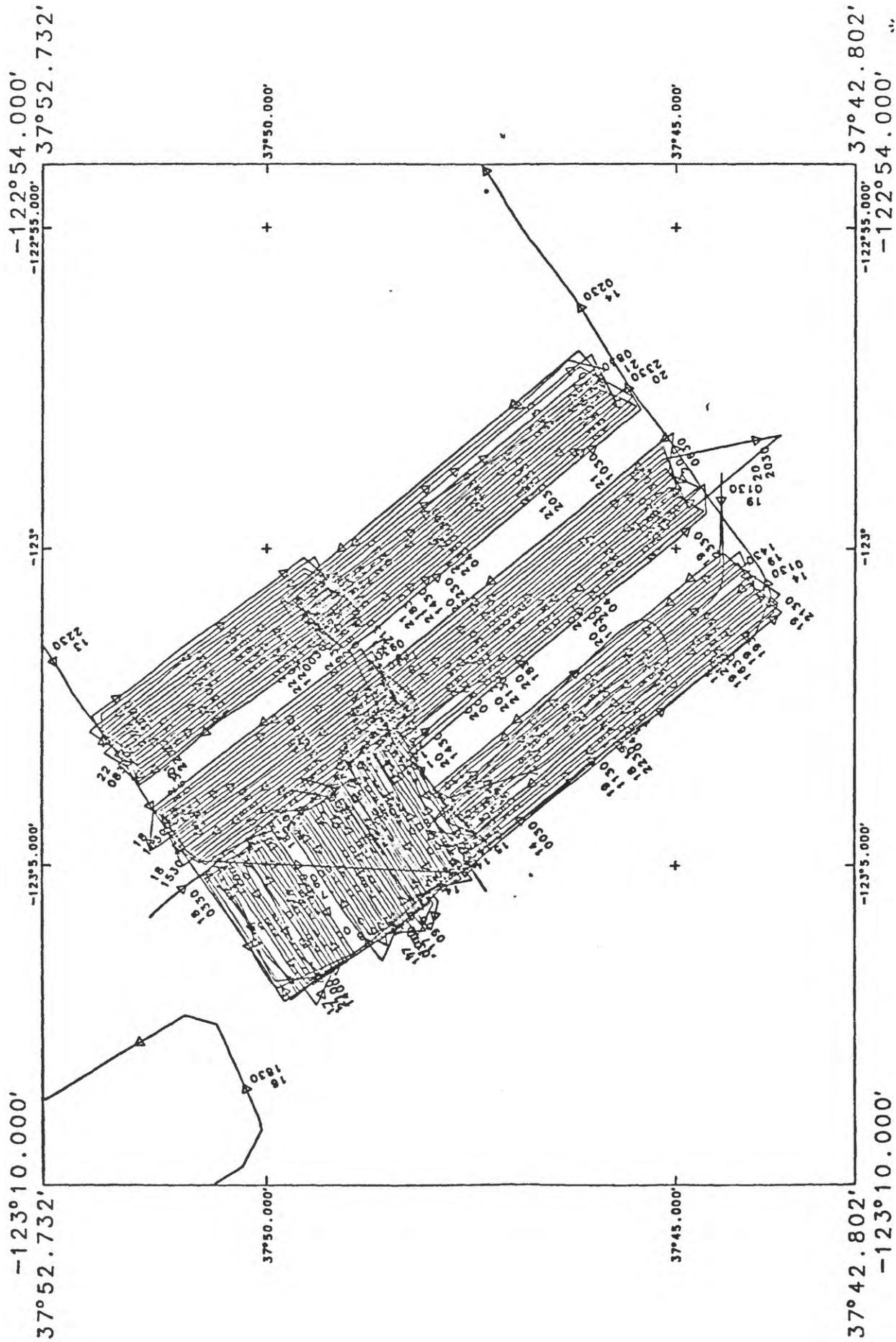


Figure 2. Tracklines in mosaic area near the Farallon Islands (boxed area on Figure 1).

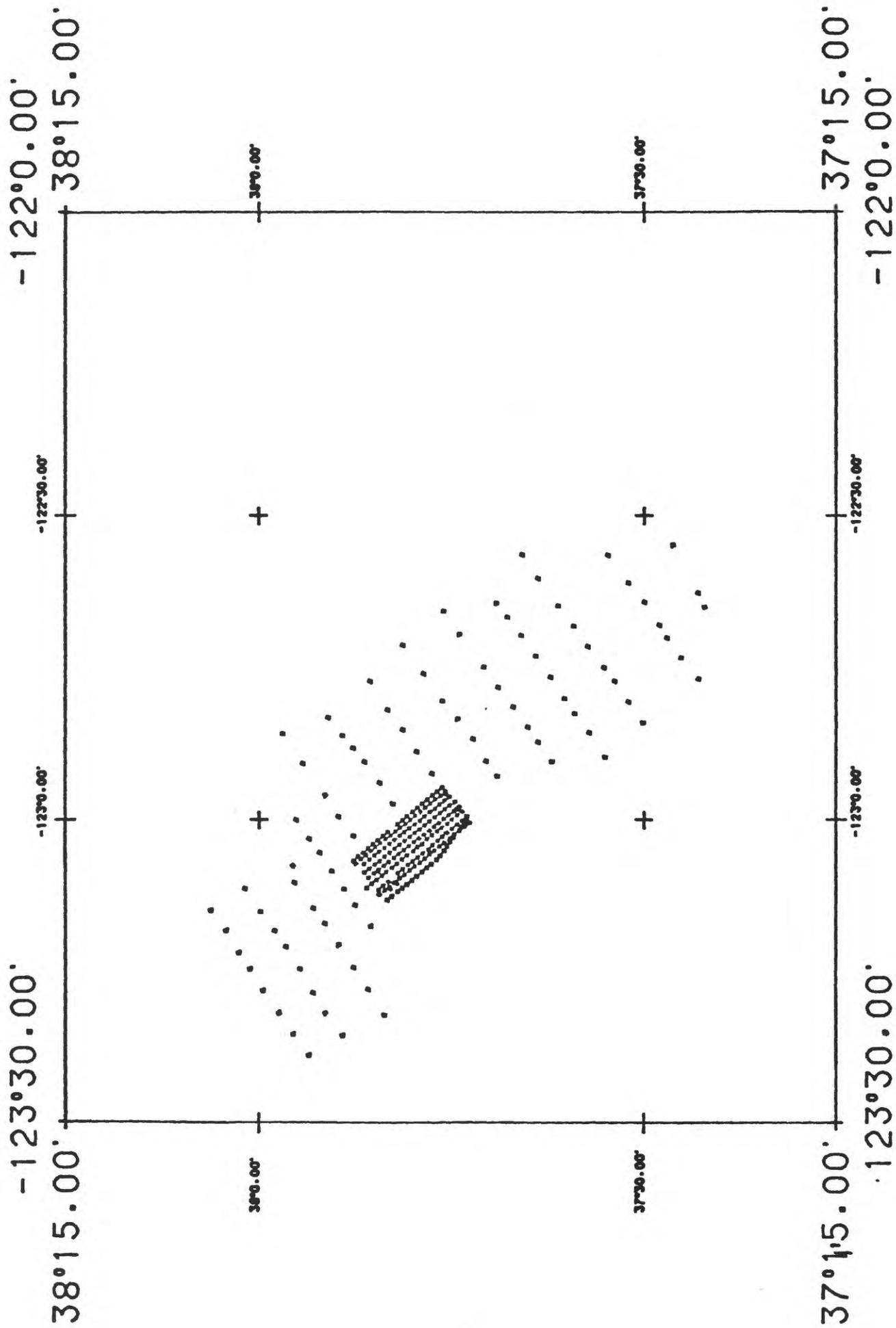


Figure 3. Locations of surface sediment grab samples collected on F2-89-NC.